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N – 7787

Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, August 2022

First Degree Programme under CBCSS

Physics

Complementary Course for Chemistry

PY 1431.2 : ATOMIC PHYSICS, QUANTUM MECHANICS AND  
ELECTRONICS

(2019 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all ten** questions in **one** or **two** sentences. **Each** question carries **1** mark.

1. Write Pauli's exclusion principle.
2. State any two applications of superconductivity.
3. Explain the term matter wave.
4. Name any four physical phenomena which could not be explained by classical theory.
5. Name the constituents of electromagnetic spectrum.
6. What are Fraunhofer lines?
7. What is the use of Zener diode?

P.T.O.

8. State any two uses of a transistor.
9. Why NAND gate is known as universal building block?
10. Explain the term space quantization.

(10 × 1 = 10 Marks)

### SECTION – B

Answer any **eight** questions, **each** question carries **2** marks.

11. What do you understand by spin orbit coupling?
12. Define electron spin and the quantum number associated with electron spin.
13. Explain isotope effect of a superconductor.
14. Explain high temperature superconductivity.
15. What were the inadequacies of classical mechanics?
16. Explain Planck's hypothesis.
17. Prove that the probability density is always real and positive.
18. What are the requirements of a mathematical function to be a wavefunction?
19. What are the significances and uses of emission spectroscopy?
20. What are the reasons for the emission of microwave spectrum?
21. Draw the I-V Characteristics of a p-n junction diode and explain different regions?
22. Draw the input and outputs of halfwave rectifier, with out and with capacitor filter.
23. Define Q-point of transistor.
24. Explain the working of different regions of a transistor.

25. Draw the circuit of an OR gate constructed using p-n junction diodes. Draw its truth table and logic symbol.
26. Which are the different number systems used in digital electronics.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. **Each** question carries **4** marks.

27. Calculate the wavelength of the first line of the Balmer series of hydrogen atom using Bohr atom model. Given that the ionization potential of Hydrogen atom is -13.6 eV.
28. Differentiate between L-S coupling and J-J coupling of electrons.
29. For a superconductor, calculate the critical field at absolute zero of temperature.  $T_c=14$  K, given that the critical field at it 10K is 1.44T.
30. Explain the magnetic properties of super conductor below the critical temperature.
31. Explain the production EM radiations in different regions of electromagnetic spectrum.
32. Calculate the permitted energy levels of an electron, in a box 1 Å wide,  $m =$  mass of the electron,  $L=1\text{Å}=10^{-10} m$ .
33. The Eigen function of an operator  $\frac{d^2}{dx^2}$ , is  $\psi = e^{2x}$ . Find the corresponding Eigen value.
34. Calculate the de Broglie wavelength associated with an electron accelerated with a potential of 100 kV.
35. Explain the working of a Zener voltage regulator with the help of a circuit diagram.
36. Using NAND gate construct AND, OR and NOT gates.

37. Calculate  $85_{10}$ - $63_{10}$  by converting these into binary by one's complement and two's complement system. Recheck your answer by converting it into the decimal number.
38. With the help of a circuit diagram explain the working of a full wave rectifier with filter.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. **Each** question carries **15** marks.

39. Explain the postulates of vector atom model. What are the quantum numbers used in Vector atom model?
40. What are the magnetic properties of a super conductor? Distinguish between type I and type II super conductors. Explain why type II super conductors are used to make high field magnets.
41. Explain the formulation of Schrodinger's equations in time independent and time dependent forms.
42. Explain the principle of various spectrometers used to detect, visible and TR regions of electromagnetic spectra.
43. What are logic gates? Explain different types of logic gates and their truth tables. What are the uses of logic gates in electronics?
44. Explain the construction and working of a full wave Bridge rectifier using 4 p-n junction diodes. Calculate its ripple factor and efficiency. Draw the input and output waveforms.

(2 × 15 = 30 Marks)